

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 292 910
A2

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 88108207.7

(51) Int. Cl.4: C11D 17/00 , C11D 10/04

(22) Date of filing: 21.05.88

(30) Priority: 28.05.87 US 54974

(43) Date of publication of application:
30.11.88 Bulletin 88/48(84) Designated Contracting States:
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(54) Hard surface cleaning composition.

(57) Physically stable, liquid, aqueous non-scratching hard surface cleaning compositions are provided and include a fatty acid or fatty acid soap, a non-soap anionic surfactant, a nonionic surfactant, electrolyte, and, as an abrasive, polymer particles having a hardness not greater than homopolymeric methyl methacrylate, and a particle size ranging from about 10 to 150 microns. These compositions can be safely used to clean, without scratching or damaging, all types of hard surfaces, including glass, plastics, enamels, and the like.

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HARD SURFACE CLEANING COMPOSITION

Background of the Invention

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(1) Field of Invention

10 This invention relates to liquid, aqueous, stable, effective, safe, non-scratching hard surface cleaning compositions commonly referred to as scouring cleansers. The compositions are physically stable, do not separate, whereby the user is assured of the optimum performance to be expected from the various components and their amounts and ratios with respect to one another, are safe and do not scratch the usual surfaces to be cleaned, such as glass, porcelain, ceramic, plastic, metal, wood, painted wood (enamelled and lacquered).

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(2) Prior Art Discussion

20 The art is, of course, replete with liquid scouring compositions alleged to perform in a safe and effective manner, others stated to be physically and chemically stable and so on.

Some examples of prior art scouring compositions include U.S. Patent 4,005,027 which describes compositions which include clay and insoluble abrasive. Only inorganic abrasives are shown. The compositions include surfactants which are bleach stable. Nonionics are not used. It is alleged that the products are physically stable and also do not "appreciably run along vertical surfaces" (column 10, lines 45-47). Such stability is a manifestation of a false body fluid formed when using the smectite and attapulgite clays necessary in such compositions. In U.S. Patent 4,116,849 the compositions are very similar to those in U.S. Patent 4,005,027. In addition, U.S. Patent 4,116,849 discloses thickening agents instead of the preferred smectite and attapulgite clays, such as colloidal silica, polystyrenes, sulfonated polystyrenes, polyethylene, oxidized polyethylenes, polypropylene, copolymers of styrene with methacrylic acid, methyl or ethyl acrylate, vinyl acetate, among others; patentee states that "...ethoxylated nonionic surfactants are to be avoided." Neither of these two patents disclose soaps or fatty acids as suitable materials as well. U.S. Patent 4,240,919 describes compositions of multivalent stearate soap, water and water-insoluble abrasive. Various abrasives are disclosed and among the "organic" types are "melamine, urea formaldehyde resins, ground rigid polymeric materials, such as polyurethane foam..." (column 3, lines 10-12). Optionally, there may be present "substantially any surfactant materials which are compatible with the other components in the composition of the present invention..." These include water-soluble anionic, nonionic, amphoteric, cationic and zwitterionic surfactants." (column 3, lines 57-62). Further reference is made to U.S. Patents 4,051,056 (expanded perlite as abrasive), 4,457,856 (polyacrylate abrasive), German 1,956,616 (polyvinyl chloride as abrasive), 3,645,904 (skin cleanser containing polymer abrasive material) and 4,302,347.

40 A composition manifesting the optimum desiderata for a non-scratching, stable, effective and safe aqueous scouring cleanser has eluded the art. The ability to remove most stains from all normally encountered hard surfaces and particularly plastic surfaces without damaging such delicate plastic materials as one might find as, for example, kitchen counter tops, anti-stick coatings on metal pots, polystyrene, polymethyl methacrylate, polyvinyl chloride, nylon, polyester (e.g. fiberglass) and the like articles is the major thrust of this invention. In addition to removing stains, the composition should have good degreasing characteristics as well. Physical stability as demonstrated by the prior art cited above is a major problem and for good consumer acceptability is a must.

Accordingly, it is an object of the present invention to provide liquid, aqueous, stable, abrasive-containing cleaning composition.

50 It is another object of this invention to provide a liquid, aqueous abrasive-containing cleaning composition which is safe and also substantially non-scratching on most encountered surfaces, including plastic surfaces.

It is still another object of our invention to provide stable, liquid, aqueous polymer abrasive-containing cleaning compositions which are safe, effective and non-scratching.

It is a further object of the invention to provide method for making the compositions of the invention.

Other objects will appear hereinafter as the description proceeds.

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Description of the Invention

10 The objects of this invention are obtained in accordance with the following description wherein the liquid non-scratching, aqueous, scouring cleansing composition comprises a fatty acid and/or fatty acid soap, non-soap anionic surfactant, nonionic surfactant, electrolyte and particulate abrasive.

The fatty acid component may be any fatty acid having a carbon chain of from about C₆-C₃₀ with C₈-C₂₀ preferred. Most preferred are C₁₀-C₁₈ and typically, naturally occurring materials, such as coconut oil, 15 palm kernel oil, and animal tallow, serve admirably as sources for the fatty acids. A particularly preferred range of fatty acids is C₁₂-C₁₈ as one would find in coconut oil. A typical coconut oil fatty acid composition contains about 50% C₁₂; 20% C₁₄; 8.5% C₁₆; and 10% C₁₈ the balance other acid and even perhaps some neutral material, and is a liquid at 40° C. While the most convenient sources are natural oils or fats yielded, mixed acids, of course, the individual specific acids, and indeed any mixture of any number and chain 20 length of acids within the parameter of C₆-C₃₀ may be used. The soaps used are the alkali metal and ammonium salts with sodium and potassium preferred. The fatty acid may comprise from about 0.5 to 15% by weight and preferably 1 to 10% and, more preferably 1 to 7% of the composition.

The non-stop anionic may be chosen from any of the conventional anionics, such as the alkyl benzene sulfonates, the alkyl sulfates, alcohol sulfates, the alcohol ether sulfates, olefin sulfonates, paraffin sul- 25 fonates, fatty acid monoglyceride sulfates, sarcosides, taurides and the like and their salts, such as alkali, alkaline, earth and ammonium salts. Of these, the sulfates and sulfonates are preferred.

The preferred non-soap anionic surfactants are the paraffin sulfonates (C₁₀-C₂₀); the linear alkyl benzene sulfonates, the alcohol and the alcohol ether sulfates.

The most preferred anionics (non-soap) are the C₁₂-C₁₈ paraffin sulfonates in the form of their alkali 30 metal or ammonium salts; C₈-C₂₀ alkyl benzene sulfonates with C₁₂-C₁₆ being most highly preferred; the alkyl (i.e. alcohol) sulfates of C₁₂-C₁₈ and the corresponding ether sulfates with 3 to 50 (e.g. 3, 5, 10, 20, 30 or 50) moles of condensed ethylene oxide. The most preferred salt forming cation is sodium. The amount of the non-soap anionic may range from 1 to 15% by weight, preferably 1 to 10% and more preferably 1 to 5% by weight.

35 Some specific examples of suitable anionics are sodium lauryl sulfate, sodium paraffin (C₁₄-C₁₇) sulfonate, sodium decyl sulfate, sodium tridecyl sulfonate, sodium tallow alkyl sulfate, sodium coconut alkyl sulfate, sodium oxotridecyl-(triethoxyl) [sulfate (sulfated - 3 E.O. condensate with oxotridecyl alcohol), sodium dodecyl benzene sulfonate, sodium tridecyl benzene sulfonate, sodium tetradecyl benzene sulfonate and sodium (C₁₅) olefin sulfonate.

40 The nonionic surfactants which are usable herein are generally characterized by a long chain hydrophobe and a poly(ethylene oxide) hydrophilic chain. The hydrophobe may and preferably is from an alcohol (C₆-C₃₀, preferably C₈-C₁₈; most preferably C₁₀-C₁₆, typically a C₁₃ alcohol, such as linear tridecyl alcohol), or a polypropylene backbone. Other hydrophobes, such as thioalcohols, acids, amines and the like, may also be used. The preferred alcohol is a C₁₀-C₁₆ alcohol with 1 to less than 5 moles of ethylene oxide 45 and most preferably 2 to 4 moles of ethylene oxide, typically 3 moles of ethylene oxide. The level of nonionic in the formulation may vary from about 0.5% to about 15% by weight with preferred levels ranging from 1 to 10% and most preferred from about 3.5 to 6.5% typically and most highly preferred is 5%.

The electrolyte used herein is typically an alkaline, builder-type inorganic or organic salt. The usual salts comprise the alkali metal bicarbonates, borates, carbonates, phosphates, polyphosphates and silicates 50 among the inorganics and the polycarboxylates, such as polyacetates, tartrates, citrates, maleates, oxydiacetates, alkenyl succinates, carboxymethyloxy succinates, oxydisuccinates and the like, among the organics. Polymeric builder salts, such as the water-soluble salts of polymers of maleic acid, itaconic acid and the like, may be used as well as copolymers and interpolymers thereof with polymerizable α,β -ethylenically unsaturated compounds, such as vinyl ethers, esters, alkyl alcohol, acrylic and methacrylic acid and esters thereof, etc. 55

The electrolyte may vary over a considerable range from as little as 0.5% to 25% or more. A preferred range is from about 2% to 15%; typically a mixture of carbonate and phosphate may total 5 to 10%; other convenient and preferred mixtures may comprise carbonate, polyphosphate and optionally some silicate in

amounts of from 5 to 10% as well.

Specific electrolytes include sodium and potassium carbonate, sodium and potassium bicarbonate, sodium and potassium sesquicarbonate, sodium and potassium orthophosphates, pyrophosphates, tripolyphosphate and hexametaphosphates, sodium and potassium tetraborate anhydrous, pentahydrate, decahydrate, sodium silicate (e.g. sodium metasilicate or other silicates with the Na_2O to SiO_2 ratio ranging from 3.5 to 1 to 1:1) as illustrative of the inorganics and ethylenediamine tetraacetic acid tetrasodium or potassium salt, trisodium nitrilotriacetate, disodium polymaleate, and the like, as merely illustrative of the organics.

The abrasive may be any material derived from a polymerizable composition, such as polyethylene, polypropylene, polystyrene, polyester, polyvinyl chloride, polyvinyl acetate, polymethyl methacrylate and various copolymers and interpolymers of the foregoing. The criteria for suitability are that the material does not scratch polymethyl methacrylate and that the average particle size ranges from about 10 to 150 microns and preferably from 25 to 100 microns and most preferably from 30 to 75 microns, e.g. 60 microns. For optimum performance it is most desirable to utilize a polyvinyl chloride abrasive powder whose average particle size is about 60 microns, with a major amount being within the range of 30 to 75 microns. The molecular weight ranges of the polymeric abrasives may vary widely just so long as the physical properties set out above are met. Generally, molecular weights will range from several thousand (e.g. 2,000; 5,000; 20,000) to several hundred thousand (e.g. 125,000; 250,000; 400,000) and upwards of several million (e.g. 1,000,000; 2,000,000; 4,000,000; 6,000,000). The amount of abrasive may range from about 2% to 30% or more (e.g. 40%; 50%). A preferred range in the preferred formulations is from 5 to 25% and more preferred is a range of 5 to 15%, such as 7%; 10%; or 12%.

A large variety of optional ingredients may be included in the formulations of this invention. Some are even preferred, such as inorganic viscosity modifiers (e.g. montmorillonite clays, such as bentonite; attapulgites, etc.); organic ones, such as methylcellulose, carboxyl methylcellulose, hydroxy propylmethylcellulose. Such materials are particularly advantageous for a "cream" scouring cleanser where a "thickened" type of material is desired by the consumer. For such products it may be desirable to have viscosities ranging from several hundred (250 cps; 400 cps; 500 cps) to several thousand (e.g. 1,100 cps; 1,500 cps; 2,000 cps, etc.).

It is extremely significant that the formulations of this invention exhibit unusual stability (i.e. lack of or minimum phase separation) in the absence of the viscosity "elevators," their major function as mentioned above to merely thicken. The amount of the viscosity modifier may range from about 0.1 to 5 to 10%; usually 0.5 to 3%. Other optional but, again, preferred additives include a hydrocarbon material, particularly a terpene, such as d-limonene. Such terpenes are readily available in many perfume materials which are generally added to most consumer cleaning products. The amount of the hydrocarbon may vary from 0.05 to 5% and preferably from 0.1 to 2 to 3%. Other additives which may be used include bleaches (liquid and solid hypochlorites, available, e.g. as NaOCl solution or calcium hypochlorite powder; chloramines, chlorinated di- and trisodium phosphates, sodium and potassium dichlorisocyanurate, trichlorocyanuric acid, and so forth); buffers, caustic soda; caustic potash; suds boosters; enzymes; preservatives; disinfectants; colorants; fragrances and the like, may be used where desired and compatible. Generally, minor amounts of such auxiliary materials are employed, e.g. 0.01 to 10% and often 0.1% to 5%.

The compositions of this invention are alkaline and generally have a pH from about 10 to 12. It is generally preferred to add in the formulations the fatty acid in free acid form and neutralize in situ with caustic soda (NaOH) or caustic potash (KOH), at the same time adjusting the pH to the desired level. A typical, preferred pH 11 ± 0.5 .

The compositions of this invention are generally prepared by adding to the formula weight of hot water with stirring in a suitable mixer and homogenizer (at a temperature of about 50 to 80°C, e.g. 60°C) the following composition in the order given: fatty acid, nonionic, viscosity modifier (if used), abrasive polymer particles, and alkali for neutralization of fatty acid; at this point the temperature of the mixture is lowered to about room temperature and then the electrolyte (e.g. builder salts) is added followed by the non-stop anionic and finally the perfume (also as a source of hydrocarbon where desired), where no hydrocarbon is to be used one may, obviously, use a non-hydrocarbon containing fragrance the use, however, of a hydrocarbon material has proven desirable for increased grease removal characteristics.

The following examples will serve to illustrate the present invention without being deemed limitative thereof. Parts and percents are by weight unless otherwise indicated.

Example I

A formulation of the following ingredients is prepared:

	%	% A.I.
Distilled coconut fatty acids	2.0	2.0
C ₁₃ alcohol and 3 moles ethylene oxide	5.0	5.0
White montmorillonite clay	0.8	0.8
Polyvinyl chloride powder (PVC) (beads of average particle size of 60μ made by an emulsion polymerization process)	10.0	10.0
50% aqueous KOH	0.5	0.25
60% tetrapotassium pyrophosphate solution (TKPP)	10.0	6.0
Potassium carbonate-granular, anhydrous (K ₂ CO ₃)	0.5	0.5
60% C ₁₄ -17 paraffin (Na) sulfonate	3.33	2.0
Perfume	0.5	0.5
tap water		balance

The composition is prepared in the manner described previously as preferred. To the formula weight of water at 60°C are added the fatty acid, nonionic, clay, abrasive and caustic potash with vigorous stirring. After a uniform mixture is obtained, it is cooled to room temperature (20°C) and the remaining components (in the order listed) are added with stirring. A creamy, stable product results; the pH is about 11 and the viscosity is about 1,100 cps.

Example II

Example I is repeated except that the following fatty acids are used in place of 2% distilled coconut fatty acid:

- (a) lauric acid 2.0%
- (b) palmitic acid 2.0%
- (c) coconut oil fatty acids 3.0%
- (d) coconut oil fatty acids 4.0%
- (e) lauric-stearic (3:1) 3.5%

Example III

Example I is repeated using 5% sodium lauryl sulfate in place of the sodium paraffin sulfonate.

Example IV

Examples I and III are repeated separately replacing the TKPP and K₂CO₃ with 4% soda ash (anhydrous Na₂CO₃).

Example V

Each of the previous examples is separately repeated but in place of 5% nonionic there is used

(a) 3% nonionic

(b) 6% nonionic.

The product of Example I is used in a standardized test procedure to determine the degree of scratching against a plastic surface. This is compared with two commercial products. The procedure involves the use of a reciprocating moving sponge (spontex) containing 1 g of test product which is applied to a plastic tile and after 200 strokes the plastic tile is washed and the gloss is compared with that of the original. The tile used has an initial gloss reading of 79 and this is unchanged after the test with the product of Example I. The two commercial products gave readings of 72 and 73 demonstrating thereby some damage to the tile by the commercial materials and none by the composition of this invention.

Claims

1. A stable, liquid, aqueous, non-scratching scouring cleaning composition comprising a fatty acid or fatty acid soap, a non-soap anionic surfactant, a nonionic surfactant, electrolyte, and particulate abrasive, said anionic surfactant being selected from the group consisting of sulfonate and sulfate surfactants, said nonionic surfactant having the molecular configuration of an hydrophobe condensed with ethylene oxide, said electrolyte comprising a water-soluble inorganic or organic builder salt and said abrasive being a solid polymerizate derived from a polymerizable, α,β -ethylenically unsaturated monomer having a hardness not greater than homopolymeric methyl methacrylate and having an average particle size ranging from about 10 to 150 microns.

2. A composition as defined in claim 1 wherein the fatty acid or soap is a C_6 - C_{30} , the non-soap anionic and the nonionic surfactants contain a C_{10} - C_{20} linear aliphatic hydrocarbon chain, the number of oxyethyl groups in the nonionic surfactant ranges from 1 to 8 and the electrolyte is an alkaline builder salt or precursor thereof.

3. A composition as defined in claim 2 wherein the fatty acid or soap is a C_8 - C_{20} acid, the non-soap anionic contains a C_{12} - C_{18} linear aliphatic hydrocarbon and the nonionic surfactant contains C_{10} - C_{16} linear aliphatic hydrocarbon.

4. A composition as defined in claim 2 wherein the amount of fatty acid or soap ranges from 0.5 to 15%, the amount of non-soap anionic ranges from 1 to 15%, the amount of nonionic from 0.5 to 15%, the amount of electrolyte from 1 to 25% and the amount of abrasive from 2 to 30%.

5. A composition as defined in claim 4 including a hydrocarbon in an amount ranging from 0.05% to 5%.

6. A composition as defined in claim 4 wherein the fatty acid or soap is derived from coconut oil, the non-soap anionic is a paraffin sulfonate, the nonionic is a C_{10} - C_{16} alcohol containing from 1 to less than 5 oxyethyl groups and the electrolyte comprises a polyphosphate.

7. A composition as defined in claim 6 wherein the abrasive is polyvinyl chloride.

8. A composition as defined in claim 7 including up to 5% hydrocarbon.

9. A composition as defined in claim 8 wherein the hydrocarbon is a terpene.

10. A composition as defined in claim 8 including from 0.05 to 5% of the hydrocarbon.

11. A composition as defined in claim 10 wherein the hydrocarbon is d-limonene.

12. A composition as defined in claim 7 wherein the amount of fatty acid or soap ranges from 1 to 5% by weight, the amount of non-soap anionic ranges from 1 to 5% by weight, the weight of nonionic ranges from 1 to 10% by weight, the amount of electrolyte ranges from 5 to 10% by weight; and the amount of abrasive ranges from 5 to 15% by weight.